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ABSTRACT

The goal of all speech rehabilitation methods is the restoration of speech as a unitary higher function. One approach views speech as a complex but coherent system where all levels and components are interconnected. This view takes into consideration the use of verbal communication, which takes place at a higher speech level and includes activity, the knowledge of language, and restoration and understanding of language, extending to the connection between words and things. The specific rehabilitation consists of a set of methods used together to treat an integrated set of functions and defects, with some methods "leading" in their treatment of the specific defect(s) and others "following" to support the functioning of other components of the speech system. A feature of this set of methods is that within each distinct method, a therapy of the concrete defect and the secondary disturbance has to restore speech as a whole system, and the methods must be used systematically. (MSE)

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L.S. TSVETKOVA'S INDIVIDUAL APHASIA REHABILITATION METHOD AND ITS APPLICATIONS

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When considering the questions on which brain mechanisms the higher psychic functions depend, and on which basis their disturbances and reorganization take place, we have to pay attention to the special features of their structure.

In the current view, psychic functions are functional systems as regards their material basis. For example, when a child is born, these systems do not yet exist (like the breathing system does), and they will not arise spontaneously but through the communication process and concrete activity.

A functional system is a uniform and integrated whole, whose material basis is formed by a selected central-peripheric construction. Its composition is not determined by topographical closeness of structures, since its area can include both near-by and distant areas. The main criterion in integrating different areas can be defined as the end-result that it has produced. Every part of this integrated constellation will carry out its own physiological role and this will produce regular features typical of the whole system. These regular characteristics are typical of the whole, but not of the individual parts. Once they are generated these functional systems function as a whole, although one cannot discern their internal make-up. These different type of anatomic and physiological structures will appear only when the system is disturbed. Every functional system is multireceptoric, i.e., it handles a certain amount of afferent signals arriving from the different parts of the brain. The functioning of the system depends precisely on the quality and the amount of the afferent impulses. Although every afferent signal will bring its own special contribution to the functional system, its role will depend on the whole and therefore it will be different in every sub-system. Afferent signals arrive from the so-called afferent area which is generated during ontogenesis. During this process, there will stand out gradually one restricted primary afference, which will carry out the necessary operation of the system. The rest of the afferences, which do have roles of their own in forming the function, fall in a latent state. They do not, however, disappear but they will form a back-up afference group. When the primary afference is disturbed or when the result differs from the normal, these back-up afferences will begin to function again. This state of affairs will exhibit the

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integrated character of the functional system. The theory of primary and back-up afferences belongs to the most important theoretical principles in rehabilitating training.

A necessary precondition for a mental function of high quality is that it will at first take place externalized, that is, when the function appears as a detailed, external operation.

Later on the function will shorten in guidance of an adult and it will change its realization level and eventually it will transform into an inner function, in other words, it will be internalized. Internalization of a function, or a gradual change from the outer to inner mental function, is a process that is generated during the human ontogenesis.

Views of disturbancies of the psychic function will thus become comprehensible and we can make the claims:

1. The mass of the secundary and tertiary zones in the brain is not uniform and disturbance or its different parts will have different consequences.
2. The amount of disturbancies of a function is not in a one-to-one relation to the size of the disturbed zone.
3. The consequence of a damage in a specific cortical zone will be a disturbance of some structural part of the psychic function, when the function is disturbed as a whole, because of this system effect. The quality of the disturbance depends on which factor (or a factor of a complicated function in the psychological structure) is damaged. This, for its part, will depend on the location of the lesion.

It is well known that speech disorders can appear both in connection with lesions in the anterior speech zones and in the temporal and parietal zones. In these cases, speech is every time disturbed on a different basis and the structure of the psychological defect will be different. Every psychic function should thus be seen in relation to the whole cortex, and not as separate units. All components are in a close interaction with each other. Although the means in performing functions can vary, the task will remain and the end-result will be constant. This demonstrates the great flexibility and adjustment capacity of the human nervous system.

Soviet neuropsychologists have created a new starting-point for rehabilitation of functions; the reorganization of the functional system in a conscious rehabilitation process.

According to them, rehabilitative training takes place with the help of a reorganization of intra and inter connections of the analyzers. Its basis is formed by

the multimodality of the functional system. When a disturbance occurs, one afferent component can be compensated by another which is resting in a latent state. Rehabilitation takes place with the help of the latent reserves of the damaged functional system.

The human functional systems are so complicated and differentiated that in a difficult functional disturbance, a new functional system can be created only with the help of specific therapy. Also those elements and afferences of the nervous system which have never earlier participated in carrying out the damaged functions will now take part in it.

Luria's investigations are of a particular interest in this area. He was the first to ask the question of the dynamic localization of the functions and of the functional system and to propose a classification of aphasia, which should take into consideration the current view of speech as a complicated functional system. Luria proved that speech is disturbed in different ways according to which factor in the structure has been damaged. Moreover, he formulated the basic principles for rehabilitation and described methods of restoring speech in different aphasias. (See Luria 1970.)

We have attributed to Bein the merit of creating the rehabilitation method of speech in the treatment of vascular aphasia. According to Bein, the most important features of the rehabilitation theory and practice are (see Bein 1964):

1. Importance of phased therapy.
2. Consideration of the semantic area in speech.
3. Differentiation of therapy methods according to form of aphasia.
4. Work which will take all forms of speech into consideration.

Typical of research work done in other countries has been to emphasize the practical side of rehabilitation. It is also typical of these studies that they pay no attention to the nature of the defect and hence the methods will be applied in all cases regardless of the form of the aphasia.

Soviet psychologists have created an effective method to restore the highest cortical functions when the cause of the disturbance of the functions is a local brain damage. The theoretical starting-point is composed of the arguments of the systematic and dynamic localization of the highest cortical functions in the cerebral cortex. Thus it has become possible to re-establish the function to its former condition through regenerating the systems that are the basis of the human psychic function.

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On the basis of the systemic and dynamic localization of the functions the consequence of the various kind of brain damages will often be a disturbance of one and the same function. Because of this, it is necessary to make an exact neuropsychological analysis of the damage and to make clear the primary defect at the background. This is inevitable in order to plan the rehabilitation tasks as differentiated units. Because of this, the re-establishing of tasks, the general therapy plan and its concrete procedures must be different in all these cases.

Rehabilitation is building a new functional system upon the preserved afferences. In therapy, one of the most important principles when re-establishing the function is the use of the undamaged analyzers. As mentioned before many various afferent systems during the ontogenesis participate in the arousal process of every higher psychic function. Hence, the function is at first multimodal. Those afferences that have fallen in the reserve are used to compensate every factor, which has fallen off the common system.

For example, a lesion in Wernicke's zone leads to a disturbance of the acoustic component of sound discrimination. In this case the undamaged factor can be replaced with the preserved visual and motor afference. These had participated in the arousal process of sound discrimination and gave lately room to the leading acoustic afference of this function. The patients learn the methods of sound discrimination appropriate in the new situation. For this purpose they use the oral sound and word scheme in the same way as they use the kinesthetic signals, which are sent by the same organs during articulation. E.g. in sensory aphasia a patient learns sound discrimination according to the following programme:

1. The patient listens to the pronunciation of the whole word.
2. He will look for the oral model of the word uttered by therapist.
3. He will imitate without, however, producing, the initial sound.
4. He will control his own oral model using a mirror.
5. He will look for the corresponding letter and will palpate its form with his fingers.
6. He will pronounce the sound and put the single letter in question under the corresponding picture.

When the patient is going through sound discrimination with the previous programme, the external means will be the function which has the following external structure when preceding from word to sound:

pronounced word	oral model of the first sound	letter	sound

The described practices include all preserved analyzers: visual, kinesthetic and kinetic and, in addition to this, it will make use of semantic level of speech.

Furthermore, in rehabilitation, one does not pay attention to multimodality only, but also to the fact that the damaged functions can have influence at different levels. In the cortical damages all the highest levels will weaken first where the functions operate maximally at the subject's own will. The level at which the function is performed automatically, or is less subject to one's own will, will suppress less. The patients are left with such social experience with speech and intellectual functions that has influence at these lower levels. The utilization of these functions strenghtened in the past is therefore one of the most important principles in therapy. When relying upon these strenghtened forms, one is bound to succeed in replacing the disturbed function temporarily to the lower and easier level. In literature, there exists evidence of this kind of method being known for a long time. E.g. in afferent motor aphasia where the elementary speech functions are better preserved, the rehabilitation begins with arousing the involuntary speech processes. In this case methods will be used that arouse the most automatic speech forms. Arousing external speech will begin with exercises that help to actualize very strong series of speech, such as series of numbers, days of a week, familiar songs and enumerating things with one's fingers. It is important to include preserved parts of emotional speech like names of persons close to the patient. Singsong reading of poems that is coupled with finger tapping in order to stress the rhythmical structure will make the arousal of involuntary speech easier.

It has turned out in practice, that the re-established speech function does not always receive an active form. All patients suffering from aphasia do not use expressive speech actively for purposes of communication with their environment after the therapy period. It is often used only with the therapist, because the therapist's means of stimulation makes the communication easier. Therefore rehabilitation has to ensure that the functions will be returned to active and self-controlled form, not only to the passive store of experience. This problem is intimately connected with the demand to create a function model that has to be adopted to suit his needs. Our analysis of existing aphasia therapy forms has proved that the most widely used method of the therapist is to show an example and act as a model. This way some component in the re-establishment of functions can be reached, but this method does not lead to the reorganization of the inner structure of the function and to an active execution of function that has to be re-established.

In rehabilitation there is usually given a list of special uncoordinated methods that are recommended for a specific form of aphasia or for rehabilitation of a defect of a certain degree. An analysis and the preparation of a rehabilitation method are often replaced by a description of the patient's general therapy plan. This demonstrates only what the patient has to do in each specific case, but it does not tell us anything about how the patient can reach the necessary result. For example in dynamic aphasia, in a disorder of producing active speech, the following tasks are recommended: retelling a story, telling from pictures, making up sentences from given words, preparing written and oral essays and so forth. An inadequacy of these methods can be seen when the patient is unable to write essays independently and besides he is unable to form a narrative with the help of pictures. Therefore one has to devise methods for the patient which will enable him to perform every exercise. It is absolutely inevitable to develop methods that organize the functioning.

For example in dynamic aphasia the re-establishment of expressive sentences is begun with performing a series of successive operations in which concrete aids are first widely used and which then are gradually dropped out. At first, the programme is performed with the help of a therapist. Later the patient has to perform the whole series of operations independently:

1. Take the picture.
2. Look at it and think about its contents.
3. Divide the picture into logical parts and draw a circle around each part.
4. Connect with an arrow those parts of the picture that are associated together.
5. Check your work.
6. Place a needed amount of cards in position.
7. Say the sentence aloud.
8. Form another alternative sentence.

As optimal therapy methods leading to a permanent rehabilitating effect, such methods are considered that re-establish the inner structure of the disturbed factor in the function by externalizing special operations whose successive, multistage performance can lead to the reorganization of the disturbed function. Corresponding series of operations form a programme that will gradually guide the patient to the disturbed function and will give him a possibility to control this function. At first, this kind of correctly composed programme serves as a guide to re-establishing the function (orientation phase). Later, when the patient has some command of the programme, he can use it in order to adjust the performance of different kinds of

functions himself. It is especially important in therapy that the programme, which first affects the function to be re-established, will lead to creation of such a programme that the patient can organize himself and he can have some effect on. The rehabilitation will not be finished until the execution of the disturbed function is transferred to the patient's control and the function is going actively on.

A function that goes on automatically is analyzed as a series of successive operations. These are accessible to the patient and they function as external control at first. Later, their execution will serve as a means of self control. In this way, the patient is given a chance to cope with the disturbed function already at the beginning of the therapy.

By adopting a stable signal system we will guarantee the necessary reanalysis and it will also increase the effectiveness of the re-establishment of functions that are guided from the outside. This proves that there will take place continuous feedback in a psychic function, a comparison between the performed and intended functioning as well as simultaneous correction of errors. The principle of feedback presupposes special means that makes the patient easier to control his own functions. For example, such tasks as using a mirror which makes it easier to control the re-establishing of movement and speech functions, or a tape which gives a chance to compare one's actual speech with the goal to be attained, have a principled importance in these conditions.

This type of therapy does not use specific methods isolated, because they could lead only to temporary or partial result. Instead, it uses the whole system, whose methods are simultaneously subject to serving the general tasks and directed towards resolving the actual therapy tasks.

Special, separately used methods can overcome only one component of the defect, but they do not re-establish the psychic process as a whole. The methods that are used here presuppose a multidimensional analysis of the defect. They will solve tasks that re-establish the function as a whole. All methods that belong to the system, are directed to solve a separate task. The method system has to suit the nature of the defect and, above all, be directed to overcome the principal defect. In that kind of systems there is often one primary method around which the others are grouped. Nevertheless, all of them function together to solve the task as a whole. Every method system will further include a series of tasks and exercises which strengthen the system effect. For example in sensory aphasia, where the immediate discrimination of phonemes is impossible, the rehabilitation must be directed to incorporation of phonetic identification process to a new functional system. The

rehabilitation of speech understanding is based on the organization of phonemes, where the immediate identification of phonemes is replaced by a detailed series of operations. These series are supported by kinesthetic and visual analysers and by the abstract meaning of phonemes. The operational series are the kernel of the whole multistage rehabilitation process of sensory aphasia.

The models of rehabilitation, their methodic constituents and the development of their psychological basis can be realized only with the help of the established method system, not by searching methods to be used separately. From the point of view of rehabilitation the progress is built upon the external guiding of the concrete functioning. With the help of this guiding there will arise some internalization of given knowledge and the automatization of performance which is to be re-established.

Next I will examine the psychological nature of the contents of the rehabilitation programme. Rehabilitation programme has different kinds of demands. As distinguished from normal therapy, in rehabilitation therapy, what is functioning only, is the functioning of the disturbed factor in the function, but not all the connections of the functions. The undisturbed factors support the realization of the performed programme, in other words, a series of successive operations. For example if a patient's defect is in reading at the level of optical identification of letters, the programme has to be planned so that there will be reserve functions that compensate the immediate optical identification of letters with another method. The other factors in the reading process are not the targets of rehabilitation and therefore they are not shown in the programme. The contents of the programme depends on the structure of the defect and therefore is defect specific every time.

One of the most important demands of every programme is that contents of the programme will be carefully chosen. The programme has to take into consideration the multistage nature of the function to be re-established and no operation can be excluded. If even one operation is excluded, a successful re-establishment of the function is not any more guaranteed. A selection of the programme's composition, a succession of operation's tasks and unlimited repetition are the criteria that can lead to the patient's high activity and independence in order to overcome the defect.

To have success in the rehabilitation of the disturbed psychic function we will need a construction of adapted operational series whose goal is the right performance of the final task. Also conditions that enable the patient to adopt externally the given programme in order to perform the disturbed function and to learn to control it later, have to be created. Within the limits of

rehabilitation there will also arise the problem of creating a method of internalization of the function model. This question is not even stated in the literature or it is only referred in passing that the method will be integrated. Nevertheless, the mechanism of integration remains unknown. The function model given to the patient can arise, when the area of operations diminishes or when individual operations brought from the outside and external aids diminishes and the performance of function is transferred gradually from one level to another.

As a theoretical and practical basis of methods we can use a theory developed by Leontyev and Galperin (Leontyev 1977 and Galperin 1979). One thesis of the theory is that any knowledge or skills cannot be transmitted as such. A learner can adopt, only when he himself has to master of performance of a given operation system. Therefore, consistency has to be taken closely into consideration in rehabilitation. Shortening of a function that has been formed too early will present difficulties.

If we want impressions of external linguistic aids can be found in patients who have received a long period of rehabilitation and we also find signs of fact that the restored function includes unformulated features that served as means in the material level of realization of the process. Therapy that includes concrete tasks in order to restore different functions has above all to be released from the general tasks of rehabilitation. In order to restore the function successfully, one has to correct the function model. The therapist has to transfer, move away disturbing mechanisms with the help of this function model that guides and organizes the patient's activity. This is an important principle in rehabilitation.

The goal of all methods that are directed to rehabilitation of the main defect is the restoration of speech as a unitary higher psychic function. The methods used here express a comprehension of speech as a complex but coherent system where all levels and components are connected with each other. Therefore, these methods also take into consideration the use of verbal communication that takes place at the higher speech level. This covers activity, the knowledge of language, the restoration and understanding of language, extending to the connections between words and things.

The specific feature of the present set of methods is that every method has to come up with two requirements: A therapy of the concrete defect and the secndary disturbance has to restore speech as a whole system, and the methods have to be systematic. The methods are not used separately but as one set of methods, which as

a whole is directed to the therapy of the corresponding defect. Specific methods can be used in many different systems, for example, nonverbal working models can be used with other methods in the therapy of spatial defects. In other cases they arouse involuntary forms of speech and in other cases they control non-productive speech.

The rehabilitation of speech and speech process is carried out in a wide area, as a unitary speech system that has been damaged in some way when the given component of the structure has been disturbed. The specific components need some compensation and others are taken along in order to support the work. Only with the help of that kind of methods that take into consideration the structure of the defect and its systemic effect on all the conditions of speech forms can the disturbed balance of the internal speech system and the outer communication system be restored. The principal leading methods are nevertheless always different and depend on the mechanism which lies behind the disturbed speech.

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